

The Curriculum for Master of Science in Engineering (Robot Systems)

The Curriculum for Master of Science in Engineering (Robot Systems)

Academic Study Board of the Faculty of Engineering

Programme titles:

- Civilingeniør i robotteknologi
- Master of Science in Engineering (Robot Systems)

ECTS value: 120

Cities: Odense

Semesters: Autumn

Effective date: 01-02-2021

Applicable for students enrolled: 01-09-2020

Version: Archive

▼ § 1 - Description of the Programme

▼ § 1.1 - Applicable for students enrolled

01-09-2020

▼ § 1.2 - Aim of Programme, including any professional profile and specialisations

The purpose of the Master's programme is to

- extend students' professional knowledge and competences and increase their theoretical and methodical qualifications and level of independent work beyond the level attained at the bachelor level.
- provide students with the opportunity for in-depth academic study via the use of advanced elements of the disciplines and methods of the academic area, including training in scientific work and methodology to develop the student's competences to perform more specialised vocational functions and participate in scientific development work, and
- to qualify the student for further education, including PhD programmes, cf. the Danish Ministerial Order on the PhD Programme at Universities.

The Master's programme is an independent, complete educational programme, which extends the competence and insights acquired by the student during the bachelor programme.

The Master's programme aims to qualify the student to solve complex technical problems, design and implement complex technological products and systems in a social context. The contents of the Master's programme aim to provide the student with advanced professional competences within the chosen discipline of engineering and options for further specialisation.

The Master's programme is a full-time programme which is rated at 120 ECTS points, corresponding to the work of a full-time student for 22 months; for programmes starting in the spring semester, however, the duration is 24 months. The programme consists of constituent course elements related to the programme's specific professional competences and identity, elective courses and a Master's thesis.

Graduates with a bachelor degree that includes knowledge and competences similar to those acquired via a bachelor programme in technical science or engineering are entitled to use the Danish title of civilingeniør, cand.polyt., followed by the title of the specific programme. The English version of the title is Master of Science (MSc) in Engineering - followed by the title of the specific programme.

▼ § 1.3 - Didactic and pedagogical basis

The Engineering Education Model of the University of Southern Denmark

The Bachelor and Master programmes within the scientific area of engineering are research-based full-degree programmes which qualify the students to independently perform vocational functions on the basis of knowledge and methodical skills within their professional area.

All programmes at the University of Southern Denmark are structured in accordance with the university's leading principles for programmes. For engineering programmes, the principles are put into practice in the educational concept 'The Engineering Education Model of the University of Southern Denmark' or, in Danish, 'Den Syddanske Model for Ingeniøruddannelser', in the following referred to by its official abbreviation, DSMI.

By offering and implementing engineering programmes based on DSMI, the university ensures that engineers who have recently graduated from the university have a high professional standard, based on their mastery of a range of core skills which are in high demand on the labour market as well as in the research community.

A summary of the main points of the education concept is shown below - the complete description of DSMI is available in electronic form at the Faculty's website.

Content and Competences

- Professional skills are at the centre of the educational activities, and all engineering programmes at the University of Southern Denmark are therefore rooted in research and development environments of a high international standard. Research and development-based tuition is provided at all programme levels to accommodate both the needs of fundamental research and the requirements of practical applied science in close collaboration with business and industry.
- The programmes aim to foster modern, dyed-in-the-wool engineers. The learning and evaluation environment is therefore based on activating tuition and active learning that stimulates students to think and work in a problem-focused, project-oriented and cross-disciplinary manner. Assignments are accomplished both in teams and independently, and the focus is on innovation and reflection.
- The programmes are designed to mature students to perform assignments in an international context. During the course of their studies, students experience an environment characterised by international teachers and researchers and fellow students from many countries. The programme framework is organised in such a way as to provide good opportunities to study abroad and students enrolled on study programmes offered in Danish, will be required to attend courses conducted in English.
- Bachelors from the University of Southern Denmark will have worked in project groups across language and cultural differences.
- To enhance the graduates' labour market value immediately after graduation, the study programmes incorporate a high level of business relevance. Collaboration with private organisations guarantees that the students' professional competences are put to regular use in a concrete, contemporary context.
- In the course of their studies, Bachelors from the University of Southern Denmark will have performed project work in collaboration with external organisations.
- All students are encouraged to think and practise entrepreneurship via a learning and evaluation environment designed to stimulate student enterprise, creativity and responsibility.
- Corporate and business understanding are integral elements of the teaching of the Bachelor programmes at the University of Southern Denmark.
- Bachelors from the University of Southern Denmark have participated in interdisciplinary collaboration projects organised on the basis of a principle of 'experts in teams'. This means that the student collaborates with students from other engineering disciplines or other study programmes on the solution of a complex, interdisciplinary problem in close collaboration with an external organisation.

Structure and Learning Environment

In overall terms, the interplay between programme structure, skills acquisition and the learning and evaluation environment of the engineering programmes at the University of Southern Denmark may be described as follows:

- In the practical planning of the programme content, significant emphasis has been placed on ensuring that the forms of tuition and examination are both relevant and contemporary and support students' acquisition of core skills. In doing so, efforts are made to provide a highly dynamic study environment, where each individual student is expected to play an active role and assume responsibility for his or her own learning. The student will 'learn to learn' so that he or she will later be able to quickly embrace new and complex problems, just as the student will be encouraged throughout the programme to practise both independent and co-operative thinking.
- In order to strengthen both the professional contemplation and application of acquired skills as well as the individual's continued motivation for developing professionally and personally on a labour market characterised by rapid change, the educational concept deliberately seeks to integrate both specific technical and broader general engineering skills.
- With DSMI, the University of Southern Denmark offers an attractive and relevant study programme with good immediate work prospects. The keywords are activating tuition and active learning put into practice through project-oriented collaboration and problem-based learning. The purpose is to foster dyed-in-the-wool engineers with a high level of professional skills and the optimum basis for continued personal and professional development.

▼ § 2 - Enrollment

▼ § 2.1 - Legal claim for admission

Following degree has automatic claim for admission:

- BSc in Engineering (Robot Systems) - University of Southern Denmark

▼ § 2.2 - Entry requirements

2.3.1 To be considered for admission applicants must have a relevant bachelor of science degree, bachelor of science in engineering degree, or bachelor of engineering degree.

For a degree to be relevant it must be in the subject area of robot systems, i.e. electrical engineering, mechatronics, robotics, automation or data technology and cover the below criteria:

- Software development and programming (C++) 20 ECTS
- Electronics - analogue and digital 15 ECTS
- Mathematics 20 ECTS

- Physics 10 ECTS
- Signal processing 10 ECTS
- Robotics related topics (e.g. computer visions and artificial intelligence) 10 ECTS

As of admission 2021 the entry requirements will be changed to the following:

- Software development and programming (C++) 20 ECTS
- Analogue and digital electronics and embedded programming 15 ECTS
- Mathematics 18 ECTS
- Physics 5 ECTS
- Signal processing and control 10 ECTS
- Robotics related topics (e.g. artificial intelligence or machine learning) 5 ECTS
- Image Processing or Computer Vision or Machine Vision 5 ECTS

Admission with a foreign degree

Applicants with a bachelor degree from a foreign university who meet the above requirements are eligible for admission subject to an academic assessment and comparison of whether the applicant's academic qualifications correspond to those of qualifying Danish degree.

English language skills

English at B level with a minimum grade of 3.0.

Applicants from a country within the European Union or the EEA are not required to pass an IELTS or a TOEFL test, if they can demonstrate knowledge of English corresponding with English at B level. The course must be passed with a grade equivalent to a minimum of 3.0 on the Danish grading scale.

Applicants from a country outside the European Union or the EEA, however, must pass an IELTS or a TOEFL test with a minimum result of 6.5 in the IELTS test or a minimum result of 88 in the TOEFL test.

For further details, please refer to the University website.

2.3.2 As a rule, the applicant must apply for admission to a Master's programme at the University of Southern Denmark within five years after completing the Bachelor programme.

▼ § 2.3 - Supplementary courses

2.4.1 Should the applicant's degree fail to meet the entry requirements, it is possible to acquire the necessary skills through supplementary courses offered at the University of Southern Denmark. The extent of supplementary courses cannot exceed 5 ECTS points.

2.4.2 Supplementary courses have to be taken after admission to the programme. The supplementary activities must be passed within the examination period of the ordinary examination and students will have only two examination attempts.

▼ § 3 - Detailed programme specific information

▼ § 3 - Programme title and profiles

▼ Advanced Robotics Technology (ART) 2020

Name

Advanced Robotics Technology (ART) 2020

Competence profile

Knowledge of:

- Classical behaviour-based and embodied approaches to AI, state space representational techniques, knowledge-based action planning techniques and heuristics
- Materials, Hooke's law, deformation, static and dynamic performance of materials, 3D printing, range of components, spectrum design
- Multivariate statistics: distributions, hypothesis testing, variance, linear regression; principal component analysis, factor analysis; grouping and clustering of multivariate observations/problems
- Principles of the geometry and kinematics in robot systems, homogeneous transformation, trajectory calibration, point-to-point robot planning algorithms
- Machine learning techniques and their experimental challenges and demands
- Advanced algorithms for motion planning and path optimization, constrained and grasp planning, collision detection, shortest paths in dynamically changing graphs and robot dynamics
- Camera models and multi camera systems, matching of image areas, 3D reconstruction and pose estimation, object recognition and tracking, structure from motion
- Scientific methods used in different fields, literature search and organization, hypothesis generation and testing, statistical test and real-world applications
- Safety requirements for robotics installation interface to MES layer, communication protocols with external equipment, OEE measurement, project planning and management with SCRUM, financial aspects of robot systems
- Budgets and their role
- Business understanding and modelling for engineers
- The pitch and its role
- Business models, including costumers and markets, sales budgets, financial considerations and budgets

Skills to:

- Design and implement solutions to non-trivial search-based problems, interface AI software and robotic components, devise simple but reliable robotic agents to support AI software
- Control an actuator, use interfaces for sensors and actuators, develop interfaces between analogue and digital electronics, and design interaction between hardware and software
- Implement multivariate methods with relevant tool(s), calculate quantitative descriptive statistics for the methods and do inferential statistics for them
- Develop and use kinematic models for robots, position and rotation computation in 3D, handle camera calibration issues, represent robot tasks as trajectories, implement robot planning algorithms, use software tools for visualizing robots
- Implement AI techniques, devise suitable representations of data for machine learning techniques, and assess performance of machine learning techniques; write a scientific paper
- Write algorithms for motion planning, path optimization and grasping, model the dynamics of a robot manipulator, and acquire new knowledge in course related research papers
- Extract 3D scene description using camera information, use 3D information for object recognition, pose estimation etc., and use redundant information to improve estimates
- Evaluate scientific papers, understand the value of standardization, benchmarking and controls, generate alternative explanations for experiments, validate research results by simple prototypes, understand the differences in methodologies across disciplines
- Understand the technological and architectural challenges by designing and implementing and integrating part of a robot system with multiple components, analyse problem and domain to determine best practice, prepare and manage a project plan and perform a feasibility study
- Share knowledge within a team
- Apply tools for project management and collaboration
- Compose a business model

Competences to:

- Recognize problems for state-based AI, choose tools and methods for representing an AI problem in a state-based formulation, and select a search/planning algorithm for a knowledge-based problem
- Develop a functional system and combining knowledge and experience from the course theory and practice, document technical results
- Communicate with mechanical engineers about the mechanical aspects of robot systems design and identify the areas of a robot system that requires mechanical engineering expertise
- Plan and design experiments in a multivariate setting, analyse data using multivariate methods, perform model check, summarize and visualize the results of an analysis and conclude, and identify and apply multivariate statistics in relevant robot systems related domains
- Solve tasks involving forward and inverse kinematics, point-to-point planning, basic robot calibration and trajectory design
- Identify robotic problems for machine learning, characterize a new AI technique, and evaluate reported applications of machine learning techniques in terms of results and methodology
- Solve problems within robot motion and task planning using state of the art methods and evaluate the results in a scientific manner
- Solve 3D computer vision problems such as pose estimation, object tracking, structure from motion, 3D reconstructions and combinations thereof
- Apply the correct methodology for the chosen scientific topic
- Implement an industrial robot installation
- Reflect on the ethical, environmental, social and quality related issues related to the business idea and the business model

The relationship between the overall competency goals of the programme and the learning objectives of the individual courses appears in the qualification matrix (annex 1).

Professional competence

The development in robot systems engineering requires engineers capable of working creatively across industrial disciplines and within research.

The Master's programme in Robot Systems Engineering ensures a broad research-based study of four robotics-related areas: computer vision, applied mathematics, artificial intelligence, and embedded systems. The breadth of the disciplines included in the programme provides the student with the skills and expertise required to make the robots of the future for production and service.

Graduates are employed mainly for research and development assignments in development-intensive manufacturing, service and consulting companies.

A Master of Science in Robot Systems Engineering with specialization in Advanced Robotics Technology works primarily in the private sector. In overall terms he or she works with:

- Research and development
- Implementation of research methodologies and research results
- Entrepreneurship and innovation
- Counselling and project management

- The robotics industry
- Welfare technology
- Image processing
- Embedded systems
- General software system engineering and programming
- Software engineering, including mobile and web applications
- Mechanical engineering
- Security systems

Programme structure

Semester 4 30 ECTS	<u>Master's Thesis - 30 ECTS</u> <u>T550018101</u> (30 ects)					
Semester 3 30 ECTS ↑	Elective course / Master's Thesis / In- company project* (5 ects)	Elective course / Master's Thesis / In- company project* (5 ects)	Elective course / In-company project* (5 ects)	Experts in Team Innovation* (15 ects)		
Semester 2 30 ECTS	Elective course (5 ects)	<u>Tools of Artificial intelligence</u> <u>T550021101</u> (5 ects)	<u>Mechanical engineering for robotics</u> <u>T550022101</u> (5 ects)	<u>Advanced Computer Vision</u> <u>T550051101</u> (5 ects)	<u>Advanced Robot Control</u> <u>T550052101</u> (5 ects)	<u>Project in Advanced Robotics</u> <u>T550053101</u> (5 ects)
Semester 1 30 ECTS	Elective course (5 ects)	<u>Multivariate statistics</u> <u>T550001101</u> (5 ects)	<u>Introduction to Artificial Intelligence</u> <u>T550000101</u> (5 ects)	<u>Scientific Method</u> <u>T550003101</u> (5 ects)	<u>Robotics and Computer Vision</u> <u>T550045101</u> (10 ects)	

Study Start
(MSc in
Engineering)
T700043101

* = IAH

☐ = Elective

☐ = Profile courses

Explanatory comments to programme structure

First semester:

- Students must pass a study start test within the first two weeks of studies in order to continue on their programme. The purpose of the test is to verify that the students have started their studies.

Third semester:

- If the thesis is of an experimental nature, the student may choose to use the optional 10 ECTS on the 3rd semester as part of the thesis. This will extend the scope of the thesis to 40 ECTS.
- Students may choose to spend 15 ECTS elective courses on an In-company Period. Similarly, a student on a 4+4 PhD programme may use 15 ECTS electives on third semester together with the 30 ECTS on fourth semester on a 45 ECTS master thesis.
- Students who have passed *Experts in Team Innovation* or *Experts in Teams* on their bachelor programme must replace *Experts in Teams Innovation* (15 ECTS) with the course *Project in Robotics* (10 ECTS) and one elective course (5 ECTS).
- Students are encouraged to complete the third semester at a foreign university. Please note that the courses must be approved by the Academic Study Board of the Faculty of Engineering.

Cities

Odense

Language

English

▼ Drones and Autonomous Systems (DAS) 2020

Name

Drones and Autonomous Systems (DAS) 2020

Competence profile

Knowledge of:

- Classical behaviour-based and embodied approaches to AI, state-space representation techniques, knowledge-based action planning techniques and heuristics
- Aerodynamic properties, aircraft configuration and stability, propellers and rotors, and aircraft materials and mechanics
- Multivariate statistics: distributions, hypothesis testing, variance, linear regression; Principal Component analysis, Factor analysis; grouping and clustering of multivariate observations
- Principles of the geometry and kinematics in robot systems, homogeneous transformation, trajectory calibration, point-to-point robot planning algorithms
- Machine learning techniques and their experimental challenges and demands
- Advanced algorithms for motion planning and path optimization, constrained and landing planning, shortest paths in dynamically changing graphs
- Camera models, matching of image areas, 3D reconstruction and pose estimation, object recognition and tracking, structure from motion
- Drones and autonomous systems: applications and current research; legislation; safety and risk assessment; airworthiness and certification; flight planning; related meteorology; platforms; flight controller hardware and software; navigation; wireless communication systems; power systems
- Scientific methods used in different fields, literature search and organization, hypothesis generation and testing, statistical test and real-world applications
- Unmanned aerial system design, safety and Danish legislative requirements for drones and autonomous systems applications, financial aspects of drones and autonomous systems applications and agile project management
- Budgets and their role
- Digital system design, including finite state machines, VHDL/FPGA, C/CPU, programmable logic to processor system communication, and communication interfaces
- Business understanding and modelling for engineers
- The pitch and its role
- Business models, including costumers and markets, sales budgets, financial considerations and budgets

Skills to:

- Design and implement solutions to non-trivial search-based problems, interface AI software and robotic components, devise simple but reliable robotic agents to support AI software
- Perform basic aerodynamic calculations and basic structural calculations; choose/develop the most appropriate aerodynamic and structural configuration
- Implement multivariate methods with relevant tool(s), calculate quantitative descriptive statistics for the methods and do inferential statistics for them
- Develop and use kinematic models for robots, position and rotation computation in 3D, handle camera calibration issues, represent robot tasks as trajectories, implement robot planning algorithms, use software tools for visualizing robots
- Implement AI techniques, devise suitable representations of data for machine learning techniques, and assess performance of machine learning techniques; write a scientific paper
- Write algorithms for motion planning, path optimization and grasping, model the dynamics of a robot manipulator, test and document planning algorithms, adapt planning algorithms for specific use, path optimization, and acquire new knowledge in course related research papers
- Extract 3D scene description using camera information, use 3D information for object recognition, pose estimation etc., and use redundant information to improve estimates
- Apply robotics skills to the design and development of unmanned aircrafts; show an overall understanding of the applicability of drones and autonomous systems technology to problems in different domains
- Evaluate scientific papers, understand the value of standardization, benchmarking and controls, generate alternative explanations for experiments, validate research results by simple prototypes, understand the differences in methodologies across disciplines
- Develop and follow a project plan based on agile principles, estimate the feasibility of implementing an autonomous system in a real-life scenario using cost/benefit analysis as well as safety analysis, design and implement an autonomous system application, such as an unmanned aircraft collaborating with other entities such as ground control, pilot etc., develop and integrate new aircraft and payload systems, interface to and extend the functionality of existing flight controller software
- Build interactions between hardware and software units, including developing the interface between various electronic components, and designing complex robotic circuits in VHDL/C and FPGA/CPU
- Share knowledge within a team
- Apply tools for project management and collaboration
- Compose a business model

Competences to:

- Recognize problems for state-based AI, choose tools and methods for representing an AI problem in a state-based formulation, and select a search/planning algorithm for a knowledge-based problem
- Develop a functional system and combining knowledge and experience from the course theory and practice, document technical results

- Initiate and carry out work within the field of drones and autonomous systems and unpredictable development within drones and autonomous systems
- Plan and design experiments in a multivariate setting, analyse data using multivariate methods, perform model check, summarize and visualize the results of an analysis and conclude, and identify and apply multivariate statistics in relevant robot systems related domains
- Solve tasks involving forward and inverse kinematics, point-to-point planning, basic robot calibration and trajectory design
- Identify robotic problems for machine learning, characterize a new AI technique, and evaluate reported applications of machine learning techniques in terms of results and methodology
- Develop applications on FPGA and CPU
- Present results in a journal documenting and verifying that the implemented applications perform as expected
- Solve problems within robot motion and task planning using state of the art methods and evaluate the results in a scientific manner
- Solve 3D computer vision problems such as pose estimation, object tracking, structure from motion, 3D reconstructions and combinations thereof
- Apply the correct methodology for the chosen scientific topic
- Participate in finding technical applicable solutions to the design and development of drones and autonomous systems subsystems and payload modules; contribute to the development in research and industrial drones and autonomous systems projects
- Participate in drones and autonomous systems research and industrial projects focusing on development while understanding the interplay with safety, legislative, financial and project management aspects
- Reflect on the ethical, environmental, social and quality related issues related to the business idea and the business model

The relationship between the overall competency goals of the programme and the learning objectives of the individual courses appears in the qualification matrix (annex 1).

Professional competence

Development in the areas of drones systems (UAS, unmanned aerial systems) and autonomous systems requires engineers capable of working creatively across industrial disciplines and within research.

The Master's programme in Robot Systems Engineering ensures a broad research-based study of four basic robotics-related areas: computer vision, applied mathematics, artificial intelligence, and embedded systems, all apply to drone and autonomous systems including mechanical disciplines. The breadth of the disciplines included in the programme provides the student with the skills and expertise required to make the drones and autonomous systems of the future.

Graduates are employed mainly for research and development assignments in development-intensive manufacturing, service and consulting companies.

A Master of Science in Robot Systems Engineering with specialisation in Drones and Autonomous Systems works primarily in the private sector. In overall terms, he or she works with:

- Research and development
- Implementation of research methodologies and research results
- Entrepreneurship and innovation
- Counselling and project management

Within

- The robotics industry
- Aircraft navigation and path planning
- Autonomous behaviour
- Flight controllers
- Sensors and signal processing
- Image processing and computer vision
- Embedded systems
- Mechanical systems
- Ground control systems
- Software engineering, including mobile and web applications
- Unmanned aircraft safety
- Security systems

Programme structure

Semester 4 30 ECTS	<u>Master's Thesis - 30 ECTS</u> <u>T550018101</u> (30 ects)					
Semester 3 30 ECTS ↑	Elective course / Master's Thesis / In- company project (5 ects)	Elective course / In- company project (5 ects)	Elective course / Master's Thesis / In-company project (5 ects)	Experts in Team Innovation (15 ects)		
Semester 2 30 ECTS	Elective course (5 ects)	<u>Tools of Artificial intelligence</u> <u>T550021101</u> (5 ects)	<u>Mechanical Aerial Systems</u> <u>T550064101</u> (5 ects)	<u>Bio-inspired Autonomous Systems</u> <u>T550061101</u> (5 ects)	<u>Large-scale Drone Perception</u> <u>T550060101</u> (5 ects)	<u>Guidance Navigation and Control</u> <u>T550012101</u> (5 ects)
Semester 1 30 ECTS	<u>Multivariate statistics</u> <u>T550001101</u> (5 ects)	<u>Introduction to Artificial Intelligence</u> <u>T550000101</u> (5 ects)	<u>Scientific Method</u> <u>T550058101</u> (5 ects)	<u>Introduction to Drone Technology</u> <u>T550063101</u> (5 ects)	<u>Classical Autonomous Systems</u> <u>T550056101</u> (5 ects)	<u>Embedded Systems</u> <u>T550059101</u> (5 ects)

Study Start
(MSc in
Engineering)
T700043101

□ = Elective

■ = Profile courses

Explanatory comments to programme structure

First semester:

- Students must pass a study start test within the first two weeks of studies in order to continue on their programme. The purpose of the test is to verify that the students have started their studies.

Third semester:

- If the thesis is of an experimental nature, the student may choose to use the optional 10 ECTS on the 3rd semester as part of the thesis. This will extend the scope of the thesis to 40 ECTS.
- Students may choose to spend 15 ECTS elective courses on an In-company Period. Similarly, a student on a 4+4 PhD programme may use 15 ECTS electives on third semester together with the 30 ECTS on fourth semester on a 45 ECTS master thesis.
- Students who have passed *Experts in Team Innovation* or *Experts in Teams* on their bachelor programme must replace *Experts in Teams Innovation* (15 ECTS) with the course *Project in Robotics* (10 ECTS) and one elective course (5 ECTS).
- Students are encouraged to complete the third semester at a foreign university. Please note that the courses must be approved by the Academic Study Board of the Faculty of Engineering.

Cities

Odense

Language

English

▼ § 3.1 - The structure of the programme

The structure of the master programme is such that it is a logical, academic extension of the bachelor programme. The first semester and the second semester contain mandatory courses in each of the four basic research areas, robotics, artificial intelligence, computer vision, and embedded systems. The courses on the first semester are accessible by way of the skills acquired in the areas of mathematics, physics, electronics, and programming on the bachelor programme. Specialization specific courses appear on the first and second semester.

The programme consists of the following elements:

- Common courses which are mandatory for all students and intended to provide the students with a broad common skills platform within the field of robot systems engineering.
- Specialization-specific courses that provide the students with the necessary skills of importance to the relevant research areas.
- Optional courses intended to define the individual student's technical profile and equip the student with the skills required to write a specialised thesis within a given area.
- The thesis intended to synthesize the student's skills in a specialized contemplation of a particular theme within robot systems engineering.

If the thesis is of an experimental nature, the student may choose to use the optional 10 ECTS on the 3rd semester as part of the thesis. This will extend the scope of the thesis to 40 ECTS. The student also has the option of project/development work for a company on the 3rd semester. The extent of this work must be 15 ECTS all of which are taken from the elective pool, thus ruling out the possibility of a 40 ECTS thesis.

The student acquires research-based skills within all relevant research areas.

In addition, the student acquires skills based on international research at the highest level within at least one of the research areas.

First semester

The modules taught during the 1st semester will present the basic research areas to the student plus offer a course in scientific method and an advanced course in statistics.

For the ART specialisation the semester is divided into the following modules:

- Introduction to Artificial Intelligence (5 ECTS)
- Robotics and Computer Vision (10 ECTS)
- Multivariate Statistics (5 ECTS)
- Scientific Method (5 ECTS)
- Elective courses (5 ECTS)

For the DAS specialisation the semester is divided into the following modules:

- Introduction to Artificial Intelligence (5 ECTS)
- Multivariate Statistics (5 ECTS)
- Scientific Method (5 ECTS)
- Introduction to Drone Technology (5 ECTS)
- Classical Autonomous Systems (5 ECTS)
- Embedded Systems (5 ECTS)

Second semester

The purpose of the 2nd semester is to strengthen the student's skills within the research areas and to introduce the student to relevant aspects of mechanical engineering.

For the ART specialisation the semester is divided into the following modules:

- Tools of Artificial Intelligence (5 ECTS)
- Advanced Computer Vision (5 ECTS)
- Advanced Robot Control (5 ECTS)
- Project in Advanced Robotics (5 ECTS)
- Mechanical Engineering for Robotics (5 ECTS)
- Elective courses (5 ECTS)

For the DAS specialisation the semester is divided into the following modules:

- Tools of Artificial Intelligence (5 ECTS)
- Guidance, Navigation, and Control (5 ECTS)
- Large-scale Drone Perception (5 ECTS)
- Bio-Inspired Autonomous Systems (5 ECTS)
- Mechanical Aerial Systems (5 ECTS)
- Elective courses (5 ECTS)

Third semester

On the third semester the following courses are offered to both profiles:

- Experts in Team Innovation (15 ECTS). *For students who have passed Experts in Team Innovation / Experts in Teams on their bachelor programme this course is replaced with Project in Robotics (10 ECTS) + an elective course (5 ECTS)*
- Optional courses or activities (5-15 ECTS)
- Optional initial phase of master thesis (10 ECTS)

On the third semester, the student will have to make choices about the thesis. The thesis must be of either 40 ECTS or 30 ECTS. The former is recommended, and in that case, the project must be defined no later than by September 1st.

The module Experts in Teams Innovation can be seen as an extension of Scientific Method, as the module strengthens the student's skills in scientific work and research with a focus on interdisciplinary aspects.

In addition, the third semester includes an optional block of 15 ECTS. Thus, if the student choose to do a 40 ECTS thesis, there will be 5 ECTS left for elective courses. Students who choose to do a 30 ECTS thesis will have 15 ECTS left for elective courses or possibly an individual study activity in co-operation with a researcher. As a general rule, the individual study activity must have an extent of 5 ECTS. The student also has the option of conducting a project (15 ECTS) in a company in the region. The work has to be related to ongoing research at the faculty, and if the student chooses this path, the thesis can only be 30 ECTS.

STUDY ABROAD

It is possible to spend the third semester at a university abroad, provided the courses are approved by the Academic Study Board of the Faculty of Engineering.

Fourth semester

On the fourth semester, the student will prepare a 30 ECTS thesis or continue the work on a 40 ECTS thesis, which commenced in the third semester. It is recommended that the thesis is completed by a group consisting of two students, preferably in collaboration with the local industry.

▼ § 3.1.1 - Connection between entry requirements and the first year

The MSc in Engineering in Robot Systems builds on the knowledge achieved at the BSc and the BEng in Robot Systems.

The application-oriented background which the students have from their previous education is extended with an increased theoretical foundation.

The students use scientific methods to formulate, analyse and solve scientific issues.

▼ § 4 - Course Descriptions

▼ § 4 - Compulsory courses

Profile divided course descriptions

Advanced Robotics Technology (ART) 2020

Drones and Autonomous Systems (DAS) 2020

Course descriptions in the curriculum

▼ Robotics and Computer Vision

▼ Course ID

T550045101

▼ Course Title

Robotics and Computer Vision

▼ ECTS value

10

▼ Internal Course Code

RMROVI

▼ Responsible study board

Academic Study Board of the Faculty of Engineering

▼ Scientific Method

▼ Course ID

T550003101

▼ **Course Title**

Scientific Method

▼ **ECTS value**

5

▼ **Internal Course Code**

RM-SCM1

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **Introduction to Artificial Intelligence**

▼ **Course ID**

T550000101

▼ **Course Title**

Introduction to Artificial Intelligence

▼ **ECTS value**

5

▼ **Internal Course Code**

RMAI1

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **Multivariate statistics**

▼ **Course ID**

T550001101

▼ **Course Title**

Multivariate statistics

▼ **ECTS value**

5

▼ **Internal Course Code**

RMMUST

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **Introduction to Drone Technology**

▼ **Course ID**

T550063101

▼ **Course Title**

Introduction to Drone Technology

▼ **ECTS value**

5

▼ **Internal Course Code**

RM-IDT

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **Scientific Method**

▼ **Course ID**

T550058101

▼ **Course Title**

Scientific Method

▼ **ECTS value**

5

▼ **Internal Course Code**

RM-DASSCM

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **Classical Autonomous Systems**

▼ **Course ID**

T550056101

▼ **Course Title**

Classical Autonomous Systems

▼ **ECTS value**

5

▼ **Internal Course Code**

RM-CAS

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ Embedded Systems

▼ Course ID

T550059101

▼ Course Title

Embedded Systems

▼ ECTS value

5

▼ Internal Course Code

RM-EBS

▼ Responsible study board

Academic Study Board of the Faculty of Engineering

▼ Guidance Navigation and Control

▼ Course ID

T550012101

▼ Course Title

Guidance Navigation and Control

▼ ECTS value

5

▼ Internal Course Code

RM-GNC

▼ Responsible study board

Academic Study Board of the Faculty of Engineering

▼ Advanced Robot Control

▼ Course ID

T550052101

▼ Course Title

Advanced Robot Control

▼ ECTS value

5

▼ Internal Course Code

RMAROB2

▼ Responsible study board

Academic Study Board of the Faculty of Engineering

▼ Advanced Computer Vision

▼ Course ID

T550051101

▼ Course Title

Advanced Computer Vision

▼ ECTS value

5

▼ Internal Course Code

RMACV2

▼ Responsible study board

Academic Study Board of the Faculty of Engineering

▼ Project in Advanced Robotics

▼ Course ID

T550053101

▼ Course Title

Project in Advanced Robotics

▼ ECTS value

5

▼ Internal Course Code

RMEXP2

▼ Responsible study board

Academic Study Board of the Faculty of Engineering

▼ Tools of Artificial intelligence

▼ Course ID

T550021101

▼ Course Title

Tools of Artificial intelligence

▼ ECTS value

5

▼ Internal Course Code

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **Mechanical engineering for robotics**

▼ **Course ID**

T550022101

▼ **Course Title**

Mechanical engineering for robotics

▼ **ECTS value**

5

▼ **Internal Course Code**

RMMECH

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **Bio-inspired Autonomous Systems**

▼ **Course ID**

T550061101

▼ **Course Title**

Bio-inspired Autonomous Systems

▼ **ECTS value**

5

▼ **Internal Course Code**

RM-BAS

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **Mechanical Aerial Systems**

▼ **Course ID**

T550064101

▼ **Course Title**

Mechanical Aerial Systems

▼ **ECTS value**

5

▼ **Internal Course Code**

RMUASM

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **Large-scale Drone Perception**

▼ **Course ID**

T550060101

▼ **Course Title**

Large-scale Drone Perception

▼ **ECTS value**

5

▼ **Internal Course Code**

RM-LDP

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **Project in Robotics**

▼ **Course ID**

T550065101

▼ **Course Title**

Project in Robotics

▼ **ECTS value**

10

▼ **Internal Course Code**

RM-PR

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **Masters Thesis - 40 ECTS**

▼ **Course ID**

T550034101

▼ **Course Title**

Masters Thesis - 40 ECTS

▼ **ECTS value**

40

▼ **Internal Course Code**

RMMT40

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **Experts in Team Innovation (MSc)**

▼ **Course ID**

T550062101

▼ **Course Title**

Experts in Team Innovation (MSc)

▼ **ECTS value**

15

▼ **Internal Course Code**

RM-EIT

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **In-company Project**

▼ **Course ID**

T550013101

▼ **Course Title**

In-company Project

▼ **ECTS value**

15

▼ **Internal Course Code**

RM-ICP

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **Master's Thesis - 30 ECTS**

▼ **Course ID**

T550018101

▼ **Course Title**

Master's Thesis - 30 ECTS

▼ **ECTS value**

30

▼ **Internal Course Code**

RMMT30

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **Studiestartsprøve (civilingeniør)**

▼ **Course ID**

T700043101

▼ **Course Title**

Study Start (MSc in Engineering)

▼ **ECTS value**

0

▼ **Internal Course Code**

TEK-KAST

▼ **Responsible study board**

Academic Study Board of the Faculty of Engineering

▼ **§ 5 - Examination provisions**

▼ **§ 5.1 - Programme passing requirements**

5.1.1 An examination is considered to be passed and a course is considered to be approved when the student has attained the assessment 'passed', 'approved' or the grade of 2 or higher.

5.1.2 An examination examination is either graded in accordance with the 7-point grading scale, or is assessed as 'Passed / Failed' (Bestået / ikke-bestået) or 'Approved / Non-approved' (Godkendt / Ikke-godkendt). The Master's thesis is always graded in accordance with the 7-point grading scale.

5.1.3 The 'Passed/failed' and 'approved/non-approved' forms of assessment can account for no more than one-third of the programme's total number of ECTS points. This does not apply to credit transfers from previous examinations.

5.1.4 When the basis for assessing a study activity is 'tuition attendance' - this assessment is made by a teacher based on criteria students are informed of at the beginning of the course. The condition for awarding the assessment 'approved' is that the student must have achieved the objectives established for the course to such an extent that it would result in the assessment 'Approved' or a grade of 02 at minimum at an examination.

5.1.5 The basis for assessment in connection with tuition attendance may be one or more of the following:

- attendance at lectures and exercises
- completed laboratory work, portfolios and reports and completed assignments or other practical or theoretical work
- participation in guiding internal examinations
- participation in seminars.

5.1.6 The student must be notified whether or not his/her participation in the course activities has been approved before the end of the semester.

5.1.7 The study programme has been successfully completed when the student has attained:

- the grade of 2 or higher in all examinations graded in accordance with the 7-point grading scale
- the assessment 'passed' in all examinations assessed as either 'Passed' or 'Failed'
- the assessment 'Approved' in all examinations assessed as either 'Approved' or 'Non-approved'.

▼ § 5.2 - Special exams

Examinations Abroad

5.2.0.1 The Academic Study Board can grant dispensation to take examinations at a Danish representation or other site abroad, when there are exceptional circumstances that prevent the student from taking the examination(s) in Denmark. The examination can be set up as a video conference or by using other technical aids.

5.2.0.2 The student is responsible for all practical arrangements related to the examination.

5.2.0.3 All costs linked to holding the examination, cancellation of the examination due to illness (if applicable) and problems with connecting to the system, etc., for which SDU cannot be held liable, shall be paid by the student.

▼ § 5.2.1 - Start of study exam

5.2.1.1 Students enrolled on a Master's programme starting from the study start in February 2020 must take and pass a study start examination in order to continue on their programme. The purpose of the study start examination is to verify that students have commenced their programme.

5.2.1.2 The content and evaluation form of the study start test are described in the course description.

▼ § 5.3 - Spelling and writing skills

5.3.1 The assessment of the Master's thesis and other major written assignments must also, in addition to the technical content, address the student's spelling and language proficiency, regardless of the language in which the project is written.

5.3.2 The projects must be written in a concise and easily understandable language. The wording of the written presentations or the Master's thesis may have a positive or negative impact on the overall grade. Additional information on the language requirements is provided in the course descriptions.

5.3.3 The Academic Study Board may grant dispensation from the above spelling and wording requirements for students who can document that they suffer from a relevant, specific impairment (such as dyslexia).

▼ § 5.4 - Internal or external exams

5.4.1 Examinations are either external or internal. External examinations are assessed by the teacher(s) and one or more external examiners appointed by the Danish Agency for Science and Higher Education. Internal examinations are assessed by one or more teachers appointed by the university.

5.4.2 At least one-third of the programme's total number of ECTS points must be documented by external assessment. This includes the most important components of the programme, including the Master's thesis, but does not apply to credits transferred from other examinations.

▼ § 5.5 - Exam language

5.5.1 For study programmes offered in Danish, examinations will be conducted in Danish, unless part of the purpose of an examination is to document the student's foreign language proficiency. Examinations may be taken in Swedish or Norwegian instead of Danish, unless the purpose of the examination is to document the student's proficiency in Danish.

5.5.2 For study programmes or individual courses offered in English or other foreign language, examinations will be conducted in that language, unless part of the purpose of an examination is to document the student's proficiency in a different language. The same applies if a course has been taught in a foreign language. The Academic Study Board may grant dispensation from this rule.

5.5.3 In addition, circumstances permitting, the Academic Study Board may allow students wishing to take an examination in a foreign language, to do so. This, however, does not apply to examinations which require presentations to be given in Danish. The Academic Study Board may grant dispensation from this rule.

▼ § 5.6 - Forms of assessment

Purpose

5.6.1 The purpose of the examination is to assess whether and to which extent the student's qualifications match the learning objectives laid down in the Danish Ministerial Order on Bachelor and Master's (Candidatus) Programmes at Universities (the University Programme Order, Uddannelsesbekendtgørelsen), the Curriculum and the respective semester planning. The final examination provides the basis for issuing a diploma.

Examination forms

5.6.2 The programme includes a variety of examination forms to reflect the content and working methods of the tuition provided. The examination forms must accommodate the purpose of the individual course/course element, and may include:

- oral, written and practical examinations, project-oriented courses and combinations of the different forms of examination.

5.6.3 Any requirements on mandatory attendance or completion of written assignments, etc., during the study period which must be met in order for the student to be allowed to take an examination at the end of the course or course element are specified in the relevant course description.

5.6.4 All written campus-based examinations must be completed using a computer in accordance with the University of Southern Denmark's rule set for written examinations.

Assessment of Group Assignments

5.6.5 Projects are normally completed by groups of students. As a rule, these groups consist of six students. The Head of Programme may allow a group to consist of fewer or more students, based on an individual professional assessment. However, these provisions do not apply to the Master's thesis.

Sound and/or Image Recordings

5.6.6 The use of sound and image recordings during an examination is not allowed, unless such recordings are part of the examination procedure. If so, such recordings will be made by the university.

Examination Aids

5.6.7 The use of examination aids is specified in the individual semester plans.

▼ § 5.7 - Irregularities at exams

Disciplinary Action

5.7.1 Disciplinary action will be taken against a student who:

- unlawfully seeks or offers help with the completion of an examination paper, or
- brings non-allowed examination aids to an examination, or
- passes the work of another off as his/her own, or
- cites his/her own previously evaluated work without adding proper references, or
- is otherwise found guilty of cheating at the examination

cf. Rules regarding Disciplinary Measures for Students at the University of Southern Denmark.

5.7.2 Disciplinary action may also be taken against a student who acts in an interruptive manner during an examination.

Errors and Defects in an Examination

5.7.3 If a student discovers errors or defects in an examination, the student must contact the evaluators (for oral examinations) or the invigilators (for written examinations).

5.7.4 In case of aggravated errors or defects, or where this must be considered the most appropriate way to remedy the error or defect, the university may cancel the examination and make arrangements to conduct an extraordinary examination. Re-examination due to cancellation of the original examination may result in a lower mark.

5.7.5 The university may offer an extraordinary examination in connection with other errors or defects. The offer must apply to all students whose examinations are affected by the error or defect in question. A student who has taken the extraordinary examination may choose to retain the original assessment given.

▼ § 5.8 - Special examination conditions

5.8.1 Students with physical or mental impairments, a native language other than Danish or similar difficulties may apply to the Academic Study Board to be granted special examination conditions. The Academic Study Board will accommodate the request if this is found necessary in order to place such students on an equal footing with others during the examination. It is a condition that the alteration does not imply a change of the level of examination.

5.8.2 The application deadline for special examination conditions is 1 September for the winter examination term and 1 February for the summer examination term. In case of chronic impairments, the Academic Study Board may approve special examination conditions for the rest of the Master's programme.

5.8.3 The diploma will not include any information on special examination conditions.

▼ § 5.9 - Ordinary exams

5.9.1 Ordinary examinations will be held immediately at the end of the course leading up to the examination.

5.9.2 The student must be prepared to sit examinations throughout the examination period, but not in July. This also applies in situations when a planned examination is moved due to *force majeure*.

▼ § 5.10 - Reexams

Reexams and Make-up Exams

5.10.1 Students who did not pass the ordinary examination and students who have been prevented from attending the examination due to illness or other unforeseen circumstances, can register for a re-examination.

5.10.2 Make-up examinations are held at the same time as re-examinations.

5.10.3 Re-examinations will be held during the same examination term as the ordinary examination. The examination period for the autumn semester is 2 January - 28/29 February and for the spring semester 1 June - 31 August. In some cases, exams can also be held in December and May. Examinations are not held in July, unless warranted by special circumstances.

5.10.4 The student shall register for a re-examination within eight days after publication of the results of the ordinary examination. Students who have been absent from the ordinary examination, shall register for a re-examination within 8 days from the date the ordinary examination was held.

5.10.5 Students cannot withdraw from registration for re-examination and it will count as a failed examination attempt if the student does not take the examination unless the Academic Study Board has granted dispensation from this rule due to extraordinary circumstances.

5.10.6 Re-examination may take a different form of examination or assessment than the ordinary examination. Students will be notified of any change in the form of examination or assessment before the examination. The form of examination for the Master Thesis, however, cannot be changed.

Consequences for not having passed an exam by 2nd attempt

5.10.7 If the student does not attend or pass the ordinary examination and the relevant re-exam, the student can register to take the examination the next time the ordinary examination is held. The student must comply with the registration period.

5.10.8 If the student failed an examination on the second attempt, the student must participate in the course and re-submit all assignments prior to the next ordinary examination, unless the course is no longer offered.

▼ § 5.11 - Exam attempts

5.11.1 A passed examination cannot be retaken.

5.11.2 A student has three attempts to pass an examination. If warranted by extraordinary circumstances, the Academic Study Board may grant additional examination attempts. The question of academic ability cannot be considered in assessing whether or not such extraordinary circumstances exist. Supplementary courses in connection with Master's programmes constitute an exception to this rule as the student has only two (2) examination attempts where supplementary activities are concerned.

5.11.3 A student whose tuition attendance is to be assessed for the second time may demand an examination instead. Tuition attendance associated with practical exercises, however, cannot be replaced by an examination.

▼ § 5.12 - Requirements for exams

Failure to Meet Examination Requirements

5.12.1 If students do not meet examination requirements, this will be regarded as one examination attempt unless the Academic Study Board grants dispensation from this rule due to extraordinary circumstances.

Absence from Examination Activities

5.12.2 If the student is absent from an examination, this leads to the student losing an examination attempt. If the evaluation of a course is based on an overall evaluation of two or more examination activities, absence from one or more activities leads to the student being registered as absent from the entire examination. The Academic Study Board can grant dispensation from this rule, if there are extraordinary circumstances.

Participation in Group Assignments

5.12.2 The student is required to participate actively in group assignments. For this reason, the work will be supervised by the academic supervisor. If a student fails to meet the requirement on active participation, the relevant programme co-ordinator, following the academic supervisor's or the Head of Programme's recommendation, may decide that the student be excluded from the group. The applicable criteria for assessing whether the group assignment work has been performed satisfactorily will be laid down for the assignment at the start of the supervision

▼ § 5.13 - Group exams

5.13.1 Examinations are arranged as individual or group examinations.

5.13.2 The basis for assessment is always individual, and individual grades are given.

5.13.3 The course description specifies the maximum number of students who can participate in a group examination. It will not be possible to choose an individual examination instead of a group examination, the examination in Master's Thesis being an exception from this rule.

▼ § 6 - Credit transfer

▼ § 6.1 - Transfer of credit

6.1 The student must apply for credit transfer for course elements passed from all previous study programmes at Master's level immediately after enrolling in the programme in question at the Faculty of Engineering.

▼ § 6.2 - Transfer of credit

6.2.1 Students who wish to take course elements from a different course or at another institute of higher education in Denmark or abroad as part of their study programme can apply to the Academic Study Board for pre-approved credit transfers for planned course elements.

6.2.2. Students who wish to take on student exchange abroad for at least a semester, must have passed courses corresponding to at least 30 ECTS points on the respective Master's study programme. Furthermore, the student exchange may not lead to an extension of the student's study period.

6.2.3 The Academic Study Board must have pre-approved credits for courses offered in the autumn semester and which form part of the student's pool of electives no later than at the Study Board's meeting in August. Likewise the Academic Study Board must have pre-approved credits for courses offered in the spring semester and which form part of the student's pool of electives no later than at the Study Board's meeting in January.

6.2.4 The Academic Study Board must have pre-approved credits for courses offered in the autumn semester and which are to replace constituent courses in the curriculum no later than at the Study Board's meeting in April. Likewise, The Academic Study Board must have preapproved credit transfer for courses offered in the spring semester and which are to replace constituent subjects in the curriculum no later than at the Study Board's meeting in November.

6.2.5 A decision of pre-approval of credit transfer puts the student under the obligation of sending documentation for passed study activities to the Academic Study Board.

6.2.6 Students must re-apply for pre-approved credit transfers if they cannot attend one or more of the course elements for which they have obtained pre-approved credit transfers.

▼ § 6.3 - Credit

6.3.1 Based on an academic assessment, the Academic Study Board may allow credit transfers for courses passed in a previous higher education programme in Denmark or abroad.

6.3.2 In order for a student to be entitled to a Danish diploma and a Danish title, no more than two-thirds of the Master's programme can be completed abroad.

6.3.3 It will not be possible to transfer credits from a Master's thesis forming the basis of a title under one Master's programme to a different title under a different Master's programme.

6.3.4 The possibilities of credit transfers will always depend on the Academic Study Board's assessment of the level of equivalence between the relevant programme components.

6.3.5 Previously passed programme components can only entitle credit transfers if they are at Master's level.

6.3.6 Course elements whose contents coincide in part or in full with the contents of constituent course elements of the study programme in question or with any already passed course elements cannot be approved as elective courses or entitle to credit transfers to the study programme. Elective courses include all course elements which have been approved by the Academic Study Board and which are not mandatory for the programme in which the student is enrolled.

6.3.7 Credit transfers are only given upon production of an original, official transcript of records (hard copy) showing the passed study activities.

6.3.8 Credit transfer with grades is possible only when the previously passed study activity was graded in accordance with the 7-point grading scale, and when there is equivalence between the previously passed study activity and the study activity being substituted. Such equivalence must exist both in terms of the technical contents and in terms of the scope of the activity, as measured in ECTS points.

▼ § 7 - Provisions on the organisation of the programme

▼ § 7.1 - Enrollment and Unenrollment from teaching and exams

Course and exam registration

7.1.1 Registration for tuition and examinations shall be conducted in compliance with SDU's rules on registering for courses and examinations.

7.1.2 Participating in registration for each semester is that the student registers for the semester's activities within the deadlines.

7.1.2.1 Registration for tuition and examination takes place electronically on Student Services Online at <https://sso.sdu.dk>.

7.1.2.2 The registration periods are May for tuition during the autumn semester and December for tuition during the spring semester. The registration period is published on the website and is sent by e-mail to students' SDU e-mail addresses. It is the student's responsibility to keep abreast of the time limits for registration.

7.1.3 Registration for a course (obligatory or elective) involves automatic registration for tuition and the associated ordinary examination and a second examination attempt (re-examination), if applicable. Registration for both compulsory and elective courses is binding. However, electives can be changed. See 7.1.4

7.1.3.1 If the student registers for courses additional to the 30 new ECTS points per semester, this registration will also be binding and cannot be cancelled.

7.1.4 Students may swap electives within the first two weeks of the start of each semester, provided they have not used examination attempts in the electives in question.

7.1.5 The student must register for tuition and examination when the subject is offered for the final time.

7.1.6 It is the responsibility of students to check their registrations at the start of the semester.

7.1.7 The university is not obliged to let a student attend courses beyond the level required to complete the study programme.

Course and Exam Withdrawal

7.1.8 Withdrawal is not permitted and absence from an examination will be considered a failed examination attempt, unless the Academic Study Board grants dispensation for withdrawal from one or more courses. The student must apply for withdrawal before the exam in the course in question is held.

▼ § 7.2 - Deadline for programme completion

Maximum Study Period

7.2.1 A student must have completed the Master's programme within two-and-a-half years of commencing the programme in compliance with SDU's Rules on Completion Times for Bachelor, Profession Bachelor or Master's Programmes. These periods do not include any periods of granted leave.

7.2.2 If warranted by special circumstances or the student is elite athlete, entrepreneur or a chairman for an organisation under the Danish Youth Council (DUF), the Academic Study Board may grant dispensation from the rules on the maximum study period.

▼ § 7.3 - Study activity

7.3.1 **Minimum Pass Grade Requirement:** A student must pass at least one ECTS qualifying examination during a coherent period of at least one year. Should this requirement not be fulfilled, the student's enrolment will be cancelled.

7.3.2 If warranted by special circumstances, the Academic Study Board can grant dispensation from the minimum pass grade requirement.

7.3.3 **Activity requirement:** See SDU'S rules on student activity.

7.3.4 If warranted by special circumstances or the student is elite athlete, entrepreneur or a chairman for an organisation under the Danish Youth Council (DUF), the Academic Study Board can grant dispensation from SDU's rules on student activity.

▼ § 7.4 - Master's thesis

7.4.1 The Master's thesis accounts for 30 ECTS or 40 ECTS points and is a major independent written assignment which is included in the final year of a Master's programme. For students admitted on the 4+4 Ph.D programme, the thesis constitutes 45 ECTS points.

7.4.2 The thesis may be written individually or jointly by two students. The relevant Head of Programme may permit joint completion of a Master's Thesis project by up to three students.

7.4.3 The thesis must document the student's competences in using scientific theory and methodology in the work with a clearly defined academic subject. The subject of the thesis must be agreed with an academic supervisor.

7.4.4 A 30 ECTS thesis must be completed in the course of four months, whereas a 40 ECTS thesis must be completed in the course of two full semesters. As a rule, the starting date and deadline for submission of the thesis are the first workday in September, and the month of January, respectively, for theses to be completed in the autumn semester, and the first workday in February, and the month of June, respectively for theses to be completed in the spring semester. In extraordinary circumstances, the Academic Study Board may grant dispensation from the above dates/deadlines.

7.4.5 The Contract for the Master's thesis must be approved by the academic supervisor, the Head of Programme and the director of studies. A Contract for the Master's Thesis project approved by all the instances mentioned above, may be amended only if dispensation to do so has been granted by the Academic Study Board. Title changes, which do not lead to a delay in the submission date, are approved by the academic supervisor.

7.4.6 The deadline for submission of the thesis is binding. If the student fails to submit the thesis report within the set deadline, the student loses one examination attempt and the student must enter into a supplementary contract within two weeks of the original submission date. The deadline will be extended by three months from this date, and the formulation of the assignment will be extended by additional deliverables corresponding to three months' work within the original subject area. The deadline can be extended by a further three months, subject to the same conditions. Every time a deadline for submission is exceeded, this will be registered as a used examination attempt.

7.4.7 A Master's thesis contract which has been approved by the Head of Studies cannot be cancelled. If a student does not pass his or her thesis examination, the student is under obligation to enter into a supplementary contract within two weeks of the original examination date. The supplementary contract means that the student shall extend the formulation of the assignment by additional deliverables corresponding to three months' work within the original subject area. The student is given three months to prepare the thesis after which a new examination will be held.

7.4.8 In situations when it has not been possible to carry out lab experiments or when collaboration with a company fails, a company goes bankrupt or there are serious problems with empirical data or method selections, etc., the Academic Study Board can decide that the student shall write a new thesis with a new topic and deadline corresponding to the scope of the thesis. See 7.6.4.

7.4.9 The Master's thesis must include an abstract in a foreign language. The course description specifies which language the abstract must be written in. If the thesis is written in a foreign language, the abstract may be written in Danish. The abstract forms part of the assessment of the thesis.

7.4.10 The specific provisions on the Master's thesis are laid down in the course description.

▼ § 7.5 - Change of profile

7.5.1 The Academic Study Board may grant dispensation to change of profile/specialisation. Students are not permitted to extend their total standard study period if they change profile/specialisation course.

▼ § 7.6 - The Master's Degree part of the 4+4 PhD programme

7.6.1 Prior to the enrolment on the PhD programme, the student must be enrolled under a Master of Engineering study programme at the University of Southern Denmark and have passed 60 ECTS (the first two semesters) of the Master's programme. The remaining 60 ECTS consist of:

- constituent (obligatory) courses on the 3rd semester of the relevant Master's study programme corresponding to 15 ECTS points
- Master's Thesis on 45 ECTS points (see 7.6 for further information about the Thesis).

7.6.2 The student must have completed the Master's programme within three years of commencing the Master's programme.

▼ § 7.7 - Individual activities

Individual Study Activities

7.7.1 Students may in agreement with a supervisor apply to the Academic Study Board for an individual study activity.

7.7.2 Individual study activities shall include a description of the learning outcomes in terms of knowledge, skills, competencies and assessment method.

7.7.3 An individual study activity may not be used to reduce the scope of the study programme and it may not overlap with the contents of the Master's Thesis.

7.7.4 As a general rule, the extent of an individual study activity may not exceed 5 ECTS points. The Academic Study Board can, under special circumstances, make an exception to this rule.

7.7.5 Individual study activities completed in the autumn semester and which do not form part of the curriculum and which are to be included in the student's pool of electives, must have been approved by the Academic Study Board no later than at the Study Board's meeting in August. Likewise, individual study activities completed in the spring semester and which do not form part of the curriculum and which are to be included in the student's pool of electives, must have been approved by the Academic Study Board no later than at the Study Board's meeting in January.

7.7.6 Individual study activities completed in the autumn semester and which do not form part of the curriculum and which are to be included in the student's constituent courses must have been approved by the Academic Study Board no later than at the Study Board's meeting in April. Likewise, individual study activities completed in the spring semester and which do not form part of the curriculum and which are to be included in the student's constituent courses must have been approved by the Academic Study Board no later than at the Study Board's meeting in November. As a general rule, individual study activities can only substitute obligatory courses in situations, where the obligatory course in question no longer is offered, the student has not used examination attempts in the course in question, and it is not possible to take an equivalent course (pre-approval of credit transfer).

▼ § 7.8 - Limitation on the number of entries

7.8.1 The university may introduce restrictions on the choice of modules and on the choice of subjects for the project assignments. The university applies academic criteria as selection criteria if there is a limited number of places on a subject. If setting academic criteria is not possible, the university may use a draw as a selection criterion.

▼ § 8 - Exemptions and complaints procedures

▼ § 8.1 - Dispensation from University regulations

8.1.1 When warranted by extraordinary circumstances, the Academic Study Board may grant dispensations from those rules of the Curriculum which have been laid down exclusively by the institution. In

certain situations, where the student is elite athlete, entrepreneur or a chairman for an organisation under the Danish Youth Council (DUF), the Academic Study Board may grant a dispensation from the curriculum or the rules of SDU. The Academic Study Board may, apart from when deciding upon extra examination attempts, consider the academic ability of the student in question.

8.1.2 Any application for dispensation from the rules of the Curriculum must be made in writing, must be reasoned, and must be accompanied by relevant documentation. Costs related to acquiring such documentation shall be borne by the student. The Academic Study Board must have received the complete application no later than eight days prior to the meeting during which the application is to be processed.

▼ § 8.2 - Complaints over exams

8.2.1 The student is entitled to complain about an examination or other evaluation that is a constituent part of the examination. Complaints may

- be procedural (i.e. concerning whether the matter has been handled in accordance with applicable law and general principles of administrative law), or
- relate to the basis of examination,
- relate to the examination procedure and/or
- relate to the assessment of the examination

and must be submitted by the student to the university no later than 14 days after publication of the examination result. The complaint must be in writing. The complaint must be addressed to the Faculty of Engineering's Secretariat and sent to tek@tek.sdu.dk.

8.2.2 The university will decide on the complaint based on the assessors' professional opinion and the complainant's comments on the result. The decision may offer a reassessment or a re-examination, or may find against the complainant. A re-assessment or re-examination could result in a lower grade. Complaints cannot be made about examination basis, examination procedures or assessment related to the study start examination.

▼ § 8.3 - Complaints over University decisions

Appeals regarding procedural matters

8.3.1 The student is entitled to file a procedural appeal (i.e. concerning whether the matter has been handled in accordance with applicable law and general principles of administrative law) against the university's decisions, including decisions made by the Academic Study Board. Procedural appeals may be submitted to the Danish Agency for Science and Higher Education.

8.3.2 The appeal must be submitted to the University no later than 14 days after the student has been notified of the contested decision. The complaint must be in writing. The appeal must be addressed to the secretariat of the Academic Study Board at the Faculty of Engineering and sent to studienaevn@tek.sdu.dk.

Complaints about credit transfers and pre-approved credit transfers

Academic issues

8.3.3 Complaints about academic issues (ie. whether the qualifications the student has/would acquire can substitute parts of the study programme in question) in connection with the refusal or partial refusal of

- pre-approved credit transfers for Danish or foreign course elements, and
- credit transfers for Danish and foreign course elements that have been passed

can be submitted to a credit transfer Appeals board in accordance with the rules on Appeals boards for decisions regarding credit transfers for university programmes (the ministerial order on credit transfer appeals boards). The complaint must be submitted to the University no later than 14 days after the student has been notified of the contested decision. The complaint must be in writing and include an explanation of the reasons for the appeal. The complaint must be addressed to the secretariat of the Academic Study Board at the Faculty of Engineering and sent to studienaevn@tek.sdu.dk.

Judicial issues

8.3.4 Complaints about judicial issues (ie. whether the case has been processed in agreement with existing laws and general principles of administrative law) in connection with the refusal or partial refusal of

- pre-approved credit transfers for Danish or foreign course elements, and
- credit transfers for Danish and foreign course elements that have been passed

can be submitted to the Vice-Chancellor's Secretariat in accordance with the rules on Appeals boards for decisions regarding credit transfers for university programmes (the ministerial order on credit transfer appeals boards). The complaint must be submitted to the University no later than 14 days after the student has been notified of the contested decision. The complaint must be in writing and include an explanation of the reasons for the appeal. The complaint must be addressed to the secretariat of the Academic Study Board at the Faculty of Engineering and sent to studienaevn@tek.sdu.dk.

▼ § 9 - The affiliation of the programme

▼ § 9 - Transitions

9.1 The rules concerning maximum period of study, which were valid at the time of admission and enrolment, apply on students admitted and enrolled on a Master's study programme before 1 September 2015. I.e. these students must have completed the study programme within 3 years from the commencement of studies.

9.2 The rules concerning the study start examination and SDU's activity requirement do not apply on students admitted and enrolled on the Master's study programme before 1 September 2015.

9.3 Transitional Curriculum Arrangements (programme specific)

Upon effective date of the curriculum, earlier curricula will be phased out and the affected courses will be taught and examined for the last time concurrently with the phasing out of the curriculum. For details please refer to the individual course descriptions.

Students enrolled on earlier curricula will continue on their current curriculum and will not be affected by these changes unless they are behind in their studies and have yet to pass courses that are no longer offered or for some other reason apply for change of curriculum.

Students enrolled on earlier curricula who do not follow the prescribed course of study will not be offered special teaching. Thus, students who have yet to pass courses that are no longer offered must replace those courses with courses from the new curriculum. This is only possible by written application to the Academic Study Board of the Faculty of Engineering and the application must be enclosed a study plan made in consultation with the programme administrator. Alternatively, students can apply to the study board for change of curriculum.

Leave of absence and re-enrolment: In cases of re-enrolment the faculty will decide whether the student is enrolled on this curriculum or will continue on his/her original curriculum. At the end of a leave of absence the student will be enrolled on his/her original curriculum unless the student applies for a change of curriculum.

▼ § 9.1 - Legal basis

This Curriculum was prepared on the basis of the authority granted by the provisions of:

- Danish Constitutional Act no. 778 of 7 August 2019 concerning the Danish Act on Universities (Universitetsloven)
- Danish Ministerial Order no. 23 of 9 January 2020 on Admission and Enrolment on Bachelor and Master's Programmes (candidatus) at Universities (Adgangsbekendtgørelsen)
- Danish Ministerial Order no. 20 of 9 January 2020 on bachelor and master's programmes (candidatus) at universities (Uddannelsesbekendtgørelsen)
- Danish Ministerial Order no. 22 of 9 January 2020 on University Examinations and Grading (Eksamensbekendtgørelsen)
- Danish Ministerial Order no. 114 of 3 February 2015 on the Grading Scale and Other Forms of Assessment under the Danish Ministry of Higher Education and Science (Karakterbekendtgørelsen)
- Danish Ministerial Order no. 1517 of 16 December 2013 on Credit Transfer Appeals Boards, as amended by the Ministerial order no. 880 of 26 August 2019 (Meritankenævnsbekendtgørelsen)
- Danish Ministerial Order no. 597 of 8 March 2015 on Talent Initiatives on Higher Education within the area of Ministry of Higher Education and Science, as amended by the Ministerial order no. 892 of 26 August 2019 (Talentbekendtgørelsen)

▼ § 9.2 - Academic Study Board

Academic Study Board of the Faculty of Engineering

▼ § 9.4 - Effective date

01-02-2021

▼ § 9.5 - Date of Study Board Approval

29-10-2020

▼ § 9.6 - Date of Deans Approval

29-04-2020